

AMENDMENTS TO SPECIFICATION:

Please replace the following paragraphs.

—[0014] (A) Preparing an ~~ultraviolet (UV) or thermal UV (or thermal)~~ curable resin containing spacer particles.—

—[0025] In accordance with a third aspect of the present invention, the resin used in the above feature is ~~composing~~ composed of:—

—[0030] In accordance with a fourth aspect of the present invention, the gravure roller used as carrier for spacer-resin should ~~be~~ coated with hydrophobic non-adhesive low surface energy layer, such as ~~Teflon~~ TEFLON[®] coating so that spacer-resin on the surface can be fully removed by doctor blade. The retained spacer-resin in the holes can also be easily transferred to the second smooth cylinder.—

—[0034] In accordance with an eighth aspect of the present invention, the sealant compound used in the second feature is ~~composing~~ composed of:—

—[0054] FIGS. 3 and 4 show the plane and the section views of the gravure cylinder, engraved with well design-patterned holes, used as a spacer-resin carrier. As shown in FIG. 4A, a metal gravure cylinder 404 was fitted with a ~~Teflon~~ TEFLON[®] sleeve 403 (or use a one piece ~~Teflon~~ TEFLON[®] gravure cylinder), which was engraved with well patterned holes 405 to be filled with spacer-particle 401 and the curable resin 402. The opening diameter and the depth of each hole is around 105-195% of the diameter of the spacer particle, so each hole will only be filled with one spacer particle with resin during operation. Alternatively, as shown in FIG. 4B, the metal gravure cylinder 404 can be engraved with well patterned holes 405 and then coated a thin layer of ~~Teflon~~ TEFLON[®]-like coating 406. The ~~Teflon~~ TEFLON[®]-like coating can either be ~~Teflon~~ TEFLON[®] or low surface energy fluorinated polymer films described in Macromolecules p.6920-6929 (2002).—

RESPONSE

10/689,683

- 6 -

—[0056] FIGs. 6A and 6B show a front and back views of an engraved gravure cylinder with a channel 602 designed if only one sealant pattern can be fitted into one gravure cylinder 601. FIG. 6C shows of more than one sealant patterns can be fitted into one gravure cylinder, which is now used as a spacer-sealant carrier. As indicated in FIG. 4A, the designed channel pattern can be similarly engraved on a hydrophobic, non-adhesive ~~Teflon~~ TEFLON[®] sleeve 702 which is covered on a metal gravure cylinder 701 as shown in FIG. 7A. Alternatively, the channel pattern can be engraved on the metal gravure cylinder 701, the coated with a thin layer of ~~Teflon~~ TEFLON[®]-like material 705 as shown in Fig. 7B. The width of the designed channel will be fitted to the regular sealant width according to the specifications, which is well known in the art, however, the depth of the channel should be the same as the depth of the hole for spacer as described in FIGs. 4A and 4B. The channel should be able to fill a group of spacer particles with the sealant compounds. The method of dispersing spacer 703-sealant 704 is similar to the method as described in FIG. 5, except replacing patterned gravure cylinder 504 with a patterned gravure cylinder as described in FIGs. 6A, 6B and 6C.—

—[0057] In another embodiment of the present invention, the resin mixture used for spacer-resin dispersions ~~comprising~~ includes of: (a) UV or thermal curable polyurethane (meth)acrylate oligomers, acrylated epoxy oligomers, and/or acrylated polyester oligomers. (b) radical polymerizable monomers, (c) photo-initiators or thermal-initiators and (d) additives.—

—[0068] In yet another embodiment of the present invention, the sealant compound ~~is comprising of~~ includes: (a) UV or thermal curable polyurethane (meth)acrylate oligomers and/or acrylated polyester oligomers. (b) radical polymerizable monomers, (c) an epoxy acrylates, (d) photo-initiators or thermal-initiators and (e) additives.—

RESPONSE

10/689,683

Please replace the following abstract.

~~The present invention is directed to a~~ method for placing spacer uniformly and securely onto the substrate of a liquid crystal display element, ~~comprising includes~~ the steps ~~[[of:]]as follows~~. (a) Prepare~~[[ing]]~~ an ~~ultraviolet(UV) or thermal [or thermal]~~ curable resin containing spacer particles. (b) Disperse~~[[ing]]~~ certain amount of above spacer-resin mixture on a gravure cylinder with well finished designed cells to be used as the spacer-resin carrier. (c) Remove~~[[ing]]~~ excess spacer-resin mixture and forced on spacer particle with resin into each hole by means of doctor knife. (d) Transfer~~[[ring]]~~ individual spacer-resin onto a ~~second~~ smooth surfaced roller according the designed pattern by means of contact. (e) Transfer~~[[ring]]~~ individual patterned spacer-resin onto the surface of substrate of a liquid crystal display element from the ~~second smooth surfaced~~ roller with any conventional coating methods. ~~Likewise, the edge sealant for LCD can be placed by a similar method.~~

RESPONSE

10/689,683

- 8 -